

of publications, may unfortunately have been overlooked. And there is, I am afraid, the inevitable personal equation of the author, which leads him to take a greater interest in some branches of the subject than in others."

Most readers will be of opinion that the author has held the balance fairly. Formal proofs of "existence theorems" are excluded. Some of these, though demanded by the upholders of mathematical rigour, tell us only what we knew before, as Kelvin used to say. Take, for example, the existence of a possible stationary temperature within a solid when the temperature at the surface is arbitrarily given. A physicist feels that nothing can make this any clearer or more certain. What is strange is that there should be so wide a gap between his intuition and the lines of argument necessary to satisfy the pure mathematician. Apart from this question it may be said that everywhere the mathematical foundation is well and truly laid, and that in not a few cases the author's formulations will be found the most convenient starting point for investigations in other subjects as well as in hydrodynamics. To almost all parts of his subject he has made entirely original contributions; and, even when this could not be claimed, his exposition of the work of others is often so much simplified and improved as to be of not inferior value. As examples may be mentioned the account of Cauchy and Poisson's theory of the waves produced in deep water by a local disturbance of the surface (§ 238)—the first satisfactory treatment of what is called in Optics a dispersive medium—and of Sommerfeld's investigation of the diffraction of plane waves of sound at the edge of a semi-infinite screen (§ 308).

Naturally a good deal of space is devoted to the motion of a liquid devoid of rotation, and to the reaction upon immersed solids. When the solids are "fairly" shaped this theory gives a reasonable approximation to what actually occurs; but when a real liquid flows past projecting angles the motion is entirely different, and unfortunately this is the case of greatest practical importance. The author, following Helmholtz, lays stress upon the negative pressure demanded at sharp corners in order to maintain what may be called the electric character of flow. This explanation may be adequate in some cases; but it is now well known that liquids are capable of sustaining negative pressures of several atmospheres. How, too, does the explanation apply to gases, which form jets under quite low-pressure differences?¹ It seems probable that viscosity must be appealed to. This is a matter which much needs further elucidation. It is the one on which Kelvin and Stokes held strongly divergent views.

The later chapters deal with vortex motion,

¹ The fact that liquids do not break under moderate negative pressure was known to T. Young. "The magnitude of the cohesion between liquids and solids, as well as of the particles of fluid with each other, is more directly shown by an experiment on the continuance of a column of mercury, in the tube of a barometer, at a height considerably greater than that at which it usually stands, on account of the pressure of the atmosphere. If the mercury has been well boiled in the tube, it may be made to remain in contact with the closed end at the height of 70 in. or more" (Young's "Lectures," p. 626, 1807). If the mercury be wet, boiling may be dispensed with, and negative pressures of two atmospheres are easily demonstrated.

tidal waves, surface waves, waves of expansion (sound), viscosity, and equilibrium of rotating masses. On all these subjects the reader will find expositions which could scarcely be improved, together with references to original writings of the author and others where further developments may be followed.

It would not have accorded with the author's scheme to go into detail upon experimental matters, but one feels that there is room for a supplementary volume which should have regard more especially to the practical side of the subject. Perhaps the time for this has not yet come. During the last few years much work has been done in connection with artificial flight. We may hope that before long this may be co-ordinated and brought into closer relation with theoretical hydrodynamics. In the meantime one can scarcely deny that much of the latter science is out of touch with reality.

RAYLEIGH.

PREHISTORY IN INDIA.

Madras Government Museum. The Foote Collection of Indian Prehistoric and Protohistoric Antiquities. Notes on their Ages and Distribution. By Robert Bruce Foote. Pp. xv + 246 + plates 64. (Madras: Government Press, 1916.) Price 14s. 8d.

THIS book must be welcomed, in default of any systematic study of the prehistoric remains. The late Mr. Bruce Foote had, for more than forty years, been collecting stone implements as a bye-issue of his professional work as Government geologist. In 1901 he published a valuable catalogue of the collection in the Government Museum at Madras. Since then he drew up the present catalogue of his own collection, which has lately been added to that museum. The photographic plates here are sufficiently good, and a large map of India (in end pocket) shows seven distinct classes of prehistoric sites by coloured signs. The arrangement by locality is useful for the future worker, but it makes the grasp of the historical results more difficult to follow.

The main question, for which no answer seems forthcoming, is that of the relative and absolute age of prehistory in India. Some assurances given here are surprising, as that in India "the iron industry is one of great antiquity (far greater, indeed, than in Europe—e.g., at Hallstatt or La Tène)" (p. 25). Also that "the iron workers were the direct successors and probably lineal descendants of the neolithic people" (p. 3). Further, that only in "the Later Iron Age we reach a period in which we find Indian man had become acquainted with three additional metals—gold, copper, and tin" (p. 3). We see here a position so different from that of western Asia and Europe that some convincing evidences are needed. Yet, unhappily, there is no stratified site to prove the succession of periods (p. 29), nor is there a single evidence stated of the relative ages. The mention of iron in the Ramayana is quoted, but that is only of the fourth century B.C. No

literary evidence is possible of iron being earlier in India than in Europe, as the oldest works, the Vedas, are, in their present form, centuries later than iron was known in Europe. So far as internal evidence goes the copper axes are closely like those of the copper age in Italy, while the iron tools have much affinity with those of the Roman period. Thus, in the absence of any evidence of position, we are thrown back on the suggestion that the iron is later than that of Europe, and succeeded the use of copper. That stone tools continued in use until iron was made, and so are found contemporaneously with it, is what is known in other countries where copper and bronze long preceded iron, without ousting the use of stone.

It will be seen, then, how the whole basis of Indian prehistory needs clearing up and defining by strict evidence fully recorded. In a land where the wealth of historic buildings far exceeds the provision for archaeology, it is a reproach to the Government and not to the archaeologist that the prehistory is left unsettled. We need first a firm basis of record of all that is contemporary with finds of Roman coins and early buildings, and before that a series of stages of groups (linked together by their resemblances in pottery, stone, and metal work) which could be projected one beyond the other into the unknown.

Some details will be of general interest. The palæolithic tools are of quartzite, the neolithic of traprock (p. 17). There are no perforated celts (p. 18). The stone axes are set through wooden handles, secured from splitting by iron ferrules (plate, p. 60). Amazon stone is found in veins in granite (p. 23), as in the Egyptian source, the site of which is unknown. W. M. F. P.

WOMEN AND THE LAND.

Women and the Land. By Viscountess Wolseley. Pp. xi+230. (London: Chatto and Windus, 1916.) Price 5s. net.

ONE of the characteristic features of the nineteenth century was the movement from the country to the city, and now in the twentieth century the process is being reversed, and there is a strong tendency to move back once more to the land. As yet it is only in the tentative stages; people go out into the country to retire, to keep a poultry farm, or to set up a fruit farm, and there is much to be learned, and still more to be done, before the movement becomes sufficiently well organised to make it a really potent factor in the national life. It is quite clear that women must take part in it, and perhaps the most notable feature in the whole business is the way in which they are organising themselves for the purpose. We may take it that, once being organised for the exodus, they are not likely to disorganise for the settlement, and the new rural community will therefore be very different from the old. The basis of the women's organisation is educational, and therein it differs from the ordinary man's "back to the land" movement, the basis of which is mainly political. It is this that makes it so full of portent for the future.

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Having found the agricultural colleges, with one or two exceptions, barred against them, some of the more enterprising and far-seeing spirits proceeded to set up colleges of their own. Amongst them is Lady Wolseley, who founded the institution at Glynde some fourteen years ago, and in the book before us she sets out the results of her experience and makes various suggestions for the future.

Lady Wolseley does not contemplate that women shall be the labourers, but rather the leaders, in the new community. She considers them well fitted for two classes of work: supervisory or advisory work for educated women belonging to the middle and upper classes; and light manual work connected with the dairy, poultry, bees, fruit, the house, etc., for the village girl. Facilities for training the advisers already exist, but little has yet been done towards teaching the more manual work.

The author maintains, however, that it is not sufficient merely to turn women into the country; some sort of common tie must be kept up, and for this purpose the best arrangement is considered to be a colony on co-operative lines, where it would be possible not only to make good business arrangements for buying and selling materials, produce, etc., but where also opportunities for social life would be afforded. The details are discussed in successive chapters. The most striking feature of the book is the seriousness with which the whole subject is taken, and the clear recognition that a second education is the only sure basis for success. E. J. R.

OUR BOOKSHELF.

The Chemists' Year-book, 1916. Edited by F. W. Attack. Vol. i., pp. 354. Vol. ii., pp. 355-990. (London and Manchester: Sherratt and Hughes, 1916.) Price 10s. 6d. net.

THIS handy book belongs to a type of chemical literature which is more common in Germany than with us. Such examples of it as we have hitherto possessed have been mainly translations from the German, and have been prepared for simultaneous issue in both countries, usually at the beginning of each year. Almanacs and year-books are common enough in all grades of business, but it is only within recent years that they have been adapted to the requirements of professional chemistry. They are essentially designed to meet the wants of practising chemists and public analysts, to whom it is a great convenience to have numerical tables, mathematical constants, and useful memoranda arranged for them in a handy and easily accessible form.

Mr. Attack's compilation is a much more comprehensive production than is usual in a work of this kind, and includes quite a remarkable body of information ranging from a list of notable dates in the history of chemistry to the pharmaceutical names of synthetic compounds and trade names of drugs, together with analytical tables, conversion tables for weights and measures, five-figure